

Climate Change and Heritage Adaptation: Challenges and solutions in North and East Africa

Online conference, 18-19th September 2024

Preliminary schedule

Time (UK)	Activity
Day one – Wednesday 18th September 2024	
09:45	Conference opens
10:00-10:15	Welcome address John Darlington (World Monuments Fund)
10:15-11:45	Panel 1
10:15-10:45	<i>Impact of climate change, urban expansion and other threats: new methods for monitoring heritage sites in Libya</i> Ahmed Buzaian, Ahmed Mahmoud and Muftah Ahmed
10:45-11:15	<i>Changing with Climate: Indigenous Knowledge and urban Heritage in Kibera</i> Mathews Wakhungu
11:15-11:45	<i>ERTH – Athar Lina Heritage and Climate Project</i> Maryam Altouny
11:45-12:30	Lunch
12:30-14:00	Panel 2
12:30-13:00	<i>Cultural and Natural Heritage Adaptation to Sea Level Rise</i> Njiiri Wallace, Mugwima Njuguna, Ephraim Wahome
13:00-13:30	<i>New approach to climate risks analysis for rock art and architecture in Africa</i> Blen Taye
13:30-14:00	<i>Climate change and urban heritage in the Egyptian Nile Valley: A view from Amarna</i> Anna Stevens, Kate Spence, Gemma Tully, Paul Docherty, Fathi Awad, Hamada Kellawy
14:00-14:30	Break
14:30-15:30	Panel 3
14:30-15:00	<i>Examining climate, biodiversity, and human interactions in Northeast Africa using Species Distribution Models</i> Ignacio A. Lazagabaster, Chris Thomas, Juliet V. Spedding, Salima Ikram, Steven Snape, Irene Solano-Regadera, Jakob Bro-Jorgensen
15:00-15:30	<i>Soil Erosion and Deposition in Geoparks within East African 2 Rift Valley: Case Study of Ngorongoro Lengai (Tanzania) and 3 Baringo (Aspiring, Kenya)</i> George Watene, Thomas Ngigi, Felix Mutua, Xianhu Wei, Thomas Biginagwa, Christognas Ngivingivi, Leka Tingitana
15:30-15:45	Discussion
15:45-16:00	Closing remarks <i>Futureproofing Heritage: Between Cairo and Norfolk</i> Leena Mekawi (Egyptian Heritage Rescue Foundation) and Heather Jermy (National Trust, Blickling Estate) for the International National Trusts Organisation (INTO) Withstanding Change Project

Time (UK)	Activity
Day two – Thursday 19th September 2024	
09:45	Conference opens
10:00-11:30	Panel 4
10:00-10:30	<i>The current climate and heritage adaptation work of ICOMOS Jordan and the Petra National Trust (PNT)</i> Haifaa Abedalhaleem, introduced by HRH Princess Dana Firas
10:30-11:00	<i>Climate Change and Culture in Eastern Africa</i> Michael Mallinson
11:00-11:30	<i>Climatic Change and Heritage Adaptation of the Pan (Kofyar) on the Jos Plateau of Central Nigeria</i> Na'ankwat Kwapnoe-Dakup
11:30-12:30	Lunch
12:30-13:30	Panel 5
12:30-13:00	<i>Museum exhibitions as a tool of reflecting the impact of the climate change crisis</i> Dina Ramadan Gohar
13:00-13:30	<i>Heritage-Climate-Community-Livelihoods</i> Khalid Shamboul, Zoe Cormack, Michael Mallinson, and Helen Mallinson
13:30-13:45	Discussion
13:45-14:00	Closing remarks Mohamed Abdrabo (Alexandria Research Center for Adaptation to Climate Change, ARCA)
14:00	Conference ends

Abstracts

Panel 1

Impact of climate change, urban expansion and other threats: New methods for monitoring heritage sites in Libya

Ahmed Buzaian, Ahmed Mahmoud, and Muftah Ahmed (Endangered Archaeology in the Middle East and North Africa Project)

The far-reaching impacts of climate change pose significant challenges to heritage protection. This paper presents the innovative application of a Machine Learning Automated Change Detection (MLACD) method developed by the Endangered Archaeology in the Middle East and North African (EAMENA) Project for monitoring archaeological sites and landscapes.

Supported by a grant from the Cultural Protection Fund, the EAMENA team organised two specialised training workshops for heritage professionals from the Libyan Department of Antiquities aimed to boost local capabilities in recording and monitoring climate change effects on cultural heritage.

The MLACD technique was applied in three regions of Libya. Initial desktop assessments were followed by fieldwork campaigns carried out by Libyan colleagues to verify and validate the remote sensing analysis. This approach, combining advanced remote sensing technologies and validation through fieldwork, offers a robust framework for monitoring and safeguarding archaeological sites, especially in regions particularly susceptible to the effects of climate change.

Changing with Climate: Indigenous Knowledge and urban Heritage in Kibera

Mathews Wakhungu (Kounkuey Design Initiative, Kenya)

This paper explores how climate change has shaped urban heritage in Kibera, specifically in the aftermath of the devastating floods in April 2024 which introduced new flooding realities and government restrictions on riparian land. Specifically, it examines (1) the impact of climate change on traditional understanding of climate, and (2) how perceptions of climate risks influenced urban heritage, including architecture and building materials. Research has included archival investigation, reflective inquiry with climate professionals, literature review and ethnographic interviews with community groups. Findings from the project will be shared through conferences, a storymap, podcast episodes of reflective inquiries, and at least one peer reviewed publication. Building on Kounkuey Design Initiative's (KDI) experiences in weather and public space projects, this study enhances understanding of urban heritage evolution and community resilience through climate-adaptive practices and raises awareness of climate impacts on heritage, especially the role of indigenous knowledge and urban heritage in addressing climate challenges.



Conservation works on the main dome of Yahya al-Shabih. Image Megawra-BEC.

ERTH – Athar Lina Heritage and Climate Project

Maryam Altouny (Megawra-BEC, Egypt)

Focusing on the heritage of al-Khalifa in Historic Cairo (left) as a case study, ERTH pilots and develops integrated solutions for climate change related threats to heritage, particularly groundwater rise, salt damp damage, and heat stress. Main activities include:

- Conservation of two Mamluk domes covering common types of climate change related damage to masonry structures in Egypt
- Onsite and offsite training and production of a manual detailing conservation techniques for climate-change related damage to historic buildings.

- Community education on integrated solutions for heritage and climate change around the two sites, with a focus on harvesting groundwater and repurposing it for greening and other uses that benefit the community.

ERTH is implemented by Megawra within the framework of Athar Lina Initiative, under the supervision of the Egyptian Ministry of Tourism and Antiquities, with funding from the British Council's Cultural Protection Fund, in partnership with the Department for Digital, Culture, Media and Sport.

Panel 2



Lamu Old Town sea front is at risk from sea level rise. Image by Njiiri Wallace.

Cultural and Natural Heritage Adaptation to Sea Level Rise

Njiiri Wallace (Jomo Kenyatta University of Agriculture and Technology, Kenya), Mugwima Njuguna (Jomo Kenyatta University of Agriculture and Technology, Kenya), and Ephraim Wahome (University of Nairobi, Kenya).

Coastal erosion, shoreline retreat and accelerated beach loss at built cultural and natural heritage sites in coastal Kenya, is on the rise. Consequences ranging from coastal flooding, surface cracking, corrosion and fungal decay, is indicative of ineffective heritage adaptation to sea level rise. Presently, cultural heritage management is predominantly reactive in nature, often necessitating very expensive coastal engineering works. These protection measures can be observed at Fort Jesus in Mombasa old town and Lamu old town sea front. This study measures historical shoreline movement based on multi-temporal Landsat images from 1994–2023 along the 536 km coastline in Kenya. Statistical techniques such as End Point Rate and Linear Regression Rate are used to quantify long term shoreline behaviour and predicted rate of shoreline change for the next 10 to 20 years. In doing so,

discussions on scenario analysis and prediction modelling are prompted for adapting cultural and natural heritage to sea level rise.

New approach to climate risks analysis for rock art and architecture in Africa

Blen Teye (University of Antwerp, Belgium)

Climate change poses risks to the protection and preservation of cultural heritage globally. Recent research has highlighted geographic limitations in climate change and cultural heritage literature, namely that the focus is predominantly on Europe, and called for more studies to address the challenges of climate change elsewhere in the world. The 2022 Intergovernmental Panel on Climate Change (IPCC) Assessment Report drew attention to the poor state of knowledge regarding direct climate risks faced by rock art across Africa. Rock art and other similar heritage assets, such as rock-cut architecture (carved structures on cliff faces, e.g. Abu Simbel, Egypt) are found in the thousands in Africa. These types of heritage, which we can collectively refer to as Rock Art and Architecture (RAA) face unprecedented risks due to climate change. This paper proposes a new approach to climate risk analysis by exploring whether studying heritage types with common characteristics (such as, RAA) is a better way to identify and respond to climate-driven hazards to cultural heritage.



A view across the site of Amarna. Courtesy: Amarna Project

Climate change and urban heritage in the Egyptian Nile Valley: A view from Amarna

Anna Stevens, Kate Spence, Gemma Tully, Paul Docherty, Fathi Awad, Hamada Kellawy (The Amarna Project and University of Cambridge, UK)

Egypt preserves some of world's most important early cities and towns, often located in a restricted zone of arable land along the Nile Valley. It is recognised that these are among Egypt's most threatened heritage sites, vulnerable to damage from population growth and looting during social crises. The effects of climate change, however, are largely unknown. Climate change is predicted to bring to the Nile Valley extreme temperatures, irregular rainfall, increasing soil salinity, and more. The attendant social impacts of these environmental changes are potentially wide-reaching.

In this paper, we reflect on climate change at Egypt's most extensively preserved ancient city, Amarna, where a range of heritage management projects is ongoing – including community archaeology, digital landscape modelling, and construction of protective boundary walls. We ask: what resources and strategies are available to predict and mitigate the effects of climate change on already vulnerable ancient settlements in Egypt's riverine landscapes?

Panel 3

Examining climate, biodiversity, and human interactions in Northeast Africa using Species Distribution Models

Ignacio A. Lazagabaster (University of Liverpool, UK), Chris Thomas (University of York, UK), Juliet V. Spedding (University of Liverpool, UK), Salima Ikram (The American University in Cairo, Egypt), Steven Snape (University of Liverpool, UK), Irene Solano-Regadera (University of Liverpool, UK), Jakob Bro-Jorgensen (University of Liverpool, UK).

This study examines the interplay of climate change, biodiversity shifts, and human activities in northeast Africa's Holocene using Species Distribution Models (SDM) and zooarchaeological data. We used modern occurrence data from online repositories and range distributions to model and predict the distribution of suitable habitats of 56 large mammal taxa. Our findings indicate a decline in suitable habitats for species requiring relatively high humidity and dense vegetation in favour of arid-adapted taxa over time, particularly towards the end of the African Humid Period about 5500 years ago. Combined SDM projections for all taxa reveal a reduction in suitable environments, especially in the region's western deserts, with favourable habitats shifting southward alongside increased settlement around the Nile. However, the persistence of suitable habitats for species beyond their extinction dates suggests significant human impacts on biodiversity beyond climate change. These findings are discussed in the context of societal transitions in ancient Egypt.

Soil Erosion and Deposition in Geoparks within East African Rift Valley: Case Study of Ngorongoro Lengai (Tanzania) and Baringo (Aspiring, Kenya)

George Watene (Jomo Kenyatta University of Agriculture and Technology, and Sino-Africa Joint Research Centre, Kenya), Thomas Ngigi (Jomo Kenyatta University of Agriculture and Technology, and Sino-Africa Joint Research Centre, Kenya), Felix Mutua (Jomo Kenyatta University of Agriculture and Technology, Kenya), Xianhu Wei (Sino-Africa Joint Research Centre, Kenya, and Aerospace Information Research Institute, China), Thomas Biginagwa (University of Dar es Salaam, Tanzania), Christognas Ngivingivi (Ministry of Natural Resources and Tourism, Tanzania), Leka Tingitana (Tanzania Flying Labs, Tanzania)

Water erosion is a major threat to natural and cultural sites since it can result in land degradation leading to artifact destruction and obliteration due to surface erosion and deposition respectively. The East African Rift Valley (EARV) region is an erosion hotspot owing to its rugged terrain and widely varying precipitation levels. Despite its rich heritage, only a few research projects have quantified deposition rates within the region. This study uses the Unit Stream Power-based Erosion Deposition (USPED) model to assess spatial-temporal distribution of surface erosion and deposition in the Ngorongoro Lengai and Baringo regional watersheds for the 1990-2022 period. At the local scale, the Intermediate Gorge within Engaruka archaeological site was 3D imaged using Unmanned Aerial Vehicle (UAV) and visually compared to archived aerial photographs. Moreover, satellite Synthetic Aperture Radar data (ALOS-PALSAR 2) was acquired over Engaruka to test its penetrative and detectability capability on obscured ancient farm terraces.

Panel 4

The current climate and heritage adaptation work of ICOMOS Jordan and the Petra National Trust

Haifaa Abedalhaleem (ICOMOS Jordan and Petra National Trust, Jordan) with an introduction by HRH Princess Dana Firas, the Hashemite Kingdom of Jordan

Climate change presents a significant threat to heritage sites in Jordan. Jordan's heritage is facing increased climatic changes such as precipitation, flash floods, and extreme weather events, which not

only jeopardize its integrity but also put local communities at risk. This paper examines the impact of climate change on some heritage sites, drawing upon climate risk assessments conducted by Petra National Trust (PNT) and ICOMOS Jordan. This assessment emphasises the urgent need for adaptive strategies, as climate-related hazards intensify social and economic vulnerabilities. By integrating scientific models with local knowledge, the assessment identifies the values and attributes that are most at risk, underscoring the importance of community involvement and traditional practices in building resilience. This paper aims to discuss the methodologies employed, the findings, and the proposed adaptive measures intended to safeguard heritage places against future climatic threats, thereby promoting a collaborative approach to heritage preservation in the face of a changing climate.

Climate Change and Culture in Eastern Africa

Michael Mallinson (Safeguarding Sudan's Living Heritage, Sudan)

The Western Sudan Community Museums Project (BIEA WSCM) learnt from Sudanese communities and professionals how Sudan's living heritage changed due to its changing environments and instigated a historical study. We examined the impact of climate change on the civilisations of Sudan over a period of 10,000 years as the rainline has steadily been moving south. The research became the core of the Safeguarding Sudan's Living Heritage (SSLH) project.

Following the conflict of April 15th, 2023, the SSLH projects have been dispersed away from the west and centre, not only to the country but also across political borders into neighbouring countries. Our understanding of the impacts of climate change has widened, along with the potential to study the effect on these countries' living heritage. This paper will give a perspective on this wider map of climate change and culture, both historically and under the current crisis. A paper on this topic was presented at the 1st Joint International Scientific Conference in the National Museum in Nairobi in June.



The Jos Plateau of Central Nigeria. Image by Na'ankwat Kwapnoe-Dakup.

Climatic Change and Heritage Adaptation of the Pan (Kofyar) on the Jos Plateau of Central Nigeria

Na'ankwat Kwapnoe-Dakup (University of East Anglia, UK)

The people of the Pan (Kofyar) culture of the Jos Plateau in central Nigeria are confined to remote hill settlements and have retained distinct traditional subsistence practices long abandoned in other parts of Africa. Their language is classified under the Chadic language group, signifying an affinity and possible migration from the East via the Lake Chad region.

Drawn from my current doctoral research, which is on the local perceptions of archaeology of the Kofyar, this paper seeks to highlight some the effects of climate change on cultural heritage practices and the traditional adaptive strategies utilised in this area. This includes divinity, water scarcity and local management systems, environmental and heritage conservation and traditional architecture.

The Pan (Kofyar) offers a great example of not only resilience to climate change and cultural conservation but also lessons for different societies around the globe.

Panel 5

Museum exhibitions as a tool for reflecting the impact of the climate change crisis

Dina Ramdan Gohar (Alexandria National Museum, Egypt)

Climate change poses a major threat to both tangible and intangible cultural heritage in Egypt. Rising sea levels, high temperatures, and heavy rains also threaten natural heritage across the wider Mediterranean and Red Sea region though this paper refers specifically to archaeological sites in the Nile Valley and Eastern and Western Deserts of Egypt.

This paper will demonstrate the effective role that museums can play in engaging local communities, raising awareness of the threats faced by cultural heritage, and enhancing local solutions to the climate crisis. Moreover, it aims to encourage museum specialists to incorporate climate change into their temporary and permanent exhibitions to engage and educate broader audiences with the target of mitigating the impacts of climate change on cultural heritage in the future.



The low lying coastlines of Africa, like Alexandria here, are vulnerable from rising sea levels caused by climate change. Image by the EES.

Heritage-Climate-Community-Livelihoods

Khalid Shamboul, Zoe Cormack, Michael Mallinson, and Dr Helen Mallinson (Safeguarding Sudan's Living Heritage, Sudan)

One of the net effects of the globalisation of heritage, whether through conservation or tourism, is the distancing of heritage from its local communities. Benefits to communities are seen through the lens of services they provide rather than helping to safeguard the culture and livelihoods of the communities directly. Climate change adaptation rather than mitigation policies, however, are inherently a community led process. This opens new possibilities for the identification, safeguarding, and management of tangible and intangible heritage.

This paper will explore the 'Green Heritage' project (under British Institute in Eastern Africa - Western Sudan Community Museums (BIEA WSCM), 2020-21), which set out to engage local communities by learning from their living heritage and its connections through climate to culture and livelihoods. The project included workshops, surveys and filming, and an exhibition prepared for the three museums in the WSCM project. The Green Heritage project and its outcomes were presented at COP28 in the British Pavilion as part of a British Council Cultural Protection Fund initiative.

Organisers



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